survey available, the present part i. of the memoir deals mainly with the extent and character of our chief resources available. The author can be assured a particular welcome for part ii., dealing with further resources, and discussing the results of other important laboratory and works tests.

The sketch-maps are of interest, but in the chief of them, showing the location of the main British resources of refractory sands in relation to the metallurgical areas, it may be pointed out that such important iron-producing areas as the West Coast of Scotland, Frodingham, Workington, and Brymbo have been omitted. W. J. R.

GOADS FOR THE PHYSICS TEACHER.

A Calendar of Leading Experiments. By William S. Franklin and Barry Macnutt. Pp. viii + 210. (South Bethlehem, Pa.: Franklin, Macnutt, and Charles, 1918.) Price 2.50 dollars.

READERS of Prof. Franklin's book, "Bill's School and Mine," will open the present volume with zest, and their anticipation of enjoyment will be increased by the remark on the title-page: "The authors are teachers, and they consider teaching to be the greatest of fun; but they never yet have been helped in their work by anything they have ever read concerning their profession." Bacon mentioned a "calendar of leading experiments for the better interpretation of Nature" as one of the things most needful for the advancement of learning, and it would seem that the authors, having failed to find assistance with regard to physical lecture demonstrations, have boldly set about filling the gap. Perhaps this method of statement is a little unfair to the excellent volume published under the auspices of the French Physical Society! The authors state that their book has to do primarily with class-room experiments in physics; secondarily it is intended to set forth the possibilities of an extended course in elementary dynamics, including the dynamics of wave motion. The writer is of opinion that most teachers will find the most stimulating part of the volume to be the humorous interludes, criticisms, and questions with which the book is filled from beginning to end. "So many things in teaching *are* funny, from our point of view." "Precision of thought is not dependent upon precision of measurement." "Science, even in its elements, presents serious difficulties." The following problem was given to a group of engineering students:—"A cart moves due northwards at a velocity of 5½ ft. per sec. A man pushes vertically downwards on the cart with a force of 200 lb., and a mule pulls due northwards on the cart with a force of 50 lb. Find the rate at which the man does work, and the rate at which the mule does work." In answer to the question 44 per cent. of the young men found that the man developed 2 h.p. and the mule developed ½ h.p. "Truly, mule-driving would be strenuous labour for our pampered college students!"

Prof. Franklin is a formidable controversialist, but one statement by the authors is certainly open to question. "It is conceivable that the atomic conceptions of electrical phenomena may some time come to be important in everyday life and in everyday engineering, but that time is certainly not yet" (p. 117). Putting aside Faraday's laws of electrolysis, the Coolidge tube and the thermionic appliances used in wireless telegraphy can scarcely be ignored at the present time.

To the experiments described it is impossible to refer at length; some are old, many are new. "The best experiments are those that are homely and simple, and suggestive rather than informing. The physics lecturer should pull ideas out of things like a prestidigitateur." The authors suggest that colleges and technical schools should have fully equipped "Visitors' Laboratories of Physics," and every member of the department, including Clarence and Pete, may take a share of the fun of edifying visitors. "The entire equipment need cost no more than four or five thousand dollars." Let our millionaires please note!

A book for physics teachers to read and ponder over. H. S. ALLEN.

APPLIED ANALYTICAL CHEMISTRY.

Treatise on Applied Analytical Chemistry. By Prof. V. Villavecchia and others. Translated by T. H. Pope. Vol. ii. Pp. xv + 536. (London: J. and A. Churchill, 1918.) Price 25*s.* net.

IT is pleasant to have in English a work like the present, emanating from Italian chemists. Such a book would be welcome at any time, but is especially so just now, when Italy is allied with us against a foe who has grossly misused his knowledge of chemical science.

Prof. Villavecchia's treatise deals with the analysis of foodstuffs and the principal industrial products, including, therefore, both organic and inorganic substances. As regards general scope and design, the book is of an intermediate character: it is not a mere summary, but neither is it so comprehensive as works like those of Allen or Post and Neumann. It does not, for example, treat of alkaloids, drugs, or pharmaceutical chemicals.

The present volume (ii.) is chiefly concerned with organic products. About one-half of the matter is devoted to foodstuffs, and the remainder to various industrial commodities, including essential oils, varnishes, rubber, tanning materials, inks, leather, colouring matters, and textile articles.

A very good selection of modern analytical methods has been made. The directions for carrying them out are clear and concise. Difficulties are pointed out, and the limitations of particular processes indicated. Methods are not merely outlined, but reasonably full descriptions are given, allowing of determinations being made with the requisite certainty and precision by any competent operator.

On looking through the various sections one finds little to criticise, and much that leaves a

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favourable impression. Sugar analysis, for example, which is often treated much too scantily in general treatises, receives adequate attention in the work under review. This chapter, in fact, is excellent, and one of the best in the book. The section on milk is quite good generally, but for use in this country it would have been improved by including the standard requirements and adapting it to English practice, much in the same way as the chapter on beer has been treated. Of the other sections, those on spirituous liquors, colouring matters, and textile articles may be singled out for commendation. The Allen-Marquardt method of determining higher alcohols, however, is not included in the first-mentioned group; presumably it is not in favour with Italian chemists.

Occasional references are given, but more might well be included, for the benefit of readers who may wish to consult the original descriptions. For example, both the Denigès colorimetric and Thorpe and Holmes's gravimetric method of estimating methyl alcohol are described, but without reference either to the authors or to the original papers.

These omissions, however, are minor matters. The work, as a whole, will be found useful and practical; it well deserves a place in the analyst's library. A meed of praise is certainly due to the translator, who has done his work very well indeed.

C. Simmonds.

OUR BOOKSHELF.

Contouring and Map-reading. By B. C. Wallis. Pp. 48. Price 2*s.*

Macmillan's Geographical Exercise Books: VII.—Physical Geography. With Questions. By B. C. Wallis. Pp. 48. (London: Macmillan and Co., Ltd., n.d.) Price 1*s.* 6*d.*

These books, which form parts of a series by the same author, have the advantage of being compiled by a teacher of wide experience who has given much thought to the presentment and mapping of geographical data. Mr. Wallis has shown considerable ingenuity in devising some of his exercises, and to a great degree has managed to avoid the trivial and merely mechanical tasks which often make such work irksome and of little value. In the volume on contouring and map-reading, which is specially to be recommended, advantage has been taken of the interest the war has given to geographical study in making use of many excellent war-maps in setting questions. Attention should also be directed to the exercises in making sketches from contour maps, though perhaps the method requires rather more explanation than is offered. In the glossary in the volume on physical geography the definition of barometric gradient requires revision. But the feature that gives the books great value is that every exercise has to be done on an accompanying map or diagram. The maps are clear and well printed, even to the smallest details. These books should give pupils an excellent grounding in the use and construction of maps.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of Nature. *No notice is taken of anonymous communications.]*

The Perception of Sound.

I would first thank those correspondents who have replied to my difficulties with respect to certain theories of the function of the cochlea. Unfortunately, the fundamental physical difficulty has not received the consideration that I hoped for, probably because it was not made sufficiently clear. Sir Thomas Wrightson (Nature, November 7) gives a quotation from Helmholtz which does not seem to me to meet the case, but perhaps it was written in connection with a different aspect of the problem. It is not obvious how the dimensions of the space filled with liquid in relation to the wave-length of the vibrations affect the nature of the process. If it were the case, the conduction of sound in liquids should be of a different nature according to the dimensions of the vessel and the pitch of the note. May I, therefore, put the question in another way?

When sound-waves impinge on water and are conducted through it, there could not be the necessary condensations and rarefactions unless the mass of water in front of the advancing wave offered sufficient resistance by its inertia to enable the local compression to take place. If the column of water moved as a whole in the way assumed by Sir Thomas Wrightson's theory, it could not conduct sound-waves as such, since there would be no possibility for the formation of any local differences of density. Now the impulses impressed by the stapes on the liquid of the cochlea are identical in time-course with sound-waves, and the nature of the disturbances in this liquid must be the same as if it were conducting sound. Of course, the column of liquid moves as a whole to relatively slow rates of incidence of energy. If a short, sharp tap be made on a membrane at one end of a column of water, the ear at the other end does not perceive the sound at the moment at which the blow is given; the transmission is by a wave. If it were necessary that the whole column of water should be moved, a large expenditure of energy would be required. It seems to be assumed that the force available is too small to do anything but move the liquid column in the cochlea as a whole, unequal to effect anything in the nature of a compression. But is this so? The force is concentrated into a very minute space. On the whole, I can see no alternative but the conclusion that the waves to which the organ of Corti responds are the same as sound-waves. I regret that Lord Rayleigh in his letter (Nature, November 21) has overlooked this point, about which his statement would have carried so much weight. It is important, however, that he does not see so many difficulties in the resonance theory as others do.

I cannot quite follow Sir Thomas Wrightson's explanation how there is produced a difference of pressure between the two sides of the basilar membrane. It seems to assume that there is a wave of pressure—that is, a sound-wave. Although the helicotrema is small, the volume of liquid moved through it is very minute (0·075 cub. mm. as a maximum, p. 96 of Sir Thomas Wrightson's book), and the existence of a difference of mechanical pressure is difficult to believe. The hairlets would not be bent unless there were such a difference.

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